PRIVATE AND SOCIAL RATES OF RETURN ON INVESTMENT IN EDUCATION IN HONG KONG

by

Fan-sing Hung

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ABSTRACT

This study investigates the relation between the earnings and the level of formal education by calculating private and social rates of return to males in Hong Kong who had completed university and senior secondary education in 1976.

Gross earnings streams by age and schooling were estimated from a cross-sectional 1% sample of the population in Hong Kong in 1976. Actual costs of schooling were also computed. The rate of return to schooling is therefore a rate of discount equating the present value of returns to the present value of costs.

Private rates of return to senior secondary and university education are estimated to be 18.5% and 25.2% respectively, and the corresponding social rates are 15% and 12.44% respectively. These estimates are unadjusted for taxation, for secular growth, for improvement of quality of schooling and of productivity over time, for differential ability, and for non-pecuniary returns and the consumption effects of schooling.

It was found that university education is heavily subsidized by the government. Also, private and social rates of return to senior secondary and matriculation education are generally higher than those in developed countries but similar with those in developing countries. This suggests the importance of investment

in education in the process of economic growth and development. As compared with some Asian countries, the rate of return estimates in Hong Kong are similar to those in Singapore but higher than those in Japan.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

INTRODUCTION

This study is concerned with the analysis of private and social rates of return to males in Hong Kong who had completed university and senior secondary education in 1976. The empirical investigation is based almost exclusively on a cross-sectional random sample from the By-Census in 1976. The main purpose of this study is to investigate the relation between the earnings and the level of formal education from the standpoints of the individual and society, with special emphasis on the comparison of the known stream of educational costs with the expected stream of future earnings that will accrue to educated individuals and to society.

Becker (1964) suggested that rates of return on education provided the most convenient and complete summary of the economic effects of education. He estimated the private and social rates of return on high school and college education in the United States in 1939 and 1949. He found that private rates of return on college education exceed those on business capital, but social rates of return are roughly similar to the yield of business capital.

Blaug (1965) calculated the private and social rates of return on educational investment in secondary and higher education in Great Britain in 1973 and discussed the policy implications of the rate-of-return approach.

Hanoch (1965) estimated private rates of return to educational investment as between regions and races in the United States in 1959.

Psacharopoulos (1973) attempted to establish systematic patterns in rates of return around the world by collating all the available country evidence on rates of return to investment in schooling: 53 case studies for 32 developed and developing countries.

No attempt has been made to estimate rates of return on education in Hong Kong. This study intends to calculate private and social rates of return on senior secondary and university education in Hong Kong in 1976. The contents of each chapter and some of the major findings are outlined briefly below.

Chapter II presents a theoretical discussion of the relation between earnings, costs, and rates of return with respect to investment in education. The application of the model to empirical analysis, and the modifications necessary to apply to private and social decisions, are explained at the end of this chapter.

Chapter III estimates the expected earnings and actual costs by age and schooling. In order to generalize the number of years required to complete each level of education, the present educational structure of Hong Kong is simplified by assuming that one and a half years is required to complete matriculation education, and three and a half years to complete university education. Secondly, the earnings estimates are adjusted for unemployment and

mortality. A smoothing process applied to them is described next, the resulting estimated smoothed earnings streams being the best estimates of the earnings of individuals by age and schooling. Finally, assumptions are made on the institutional factors which govern the estimation of actual costs invested in schooling. The later part of this chapter derives the private and social rates of return to senior secondary and university education. A critical analysis of these estimates--both with respect to some technical and statistical aspects and with respect to various theoretical biases--is presented next.

The estimated rates were compared with those of developing and developed countries in chapter IV. The estimated private and social rates to senior secondary and matriculation education in this study are found to be higher than those in developed countries but similar to those in developing countries. A contrast of estimated private and social rates indicates that university education is relatively more subsidised than senior secondary education such that the incentives for the individual to undertake the former will be strong.

Chapter V summarizes the results obtained in this study.

CHAPTER II

A THEORETICAL MODEL OF RATES OF RETURN ON INVESTMENT IN SCHOOLING

The acquisition of education is a type of investment by the individual in his own future earning capacity. However, investment in education usually extends over a long and variable period in which costs are incurred. The rate of return on education reflects the profitability of investment in education for it relates the known stream of schooling costs with the expected stream of future earnings that will accrue to an educated individual. This chapter seeks to outline a model of the relation between earnings, costs, and rates of return with respect to investment in formal schooling. The main purpose of this model is to distinguish, among other things, a change in the return from a change in the amount invested in schooling.

The theoretical set up that is used in this chapter is basically that of Becker (1964). He developed a general theory of investment in education by relating the returns and costs of two different schooling activities.

To illustrate the model for our purposes in this study, let Y be a schooling activity providing a person entering at a particular age, called age zero, with a real net earnings stream of Y_o during the first period, Y_1 during the next period, and so on until Y_n during the last period. "Net" earnings mean "Gross"

earnings during any period minus tuition costs during the same period. "Real" earnings are the sum of monetary earnings and the monetary equivalent of psychic earnings. The present value of the net earnings stream in Y would be

$$(1) \qquad V(Y) = \sum_{j=o}^{n} \frac{Y_j}{(1+i)^{j+1}}$$

where i is the market discount rate, assumed for simplicity to be the same in each period. If X were another schooling activity providing a net earnings stream of $X_o, X_1, \ldots\ldots, X_n$, with a present value of V(X), the present value of the gain from choosing Y would be given by

$$(2) \qquad d = V(Y) - V(X) = \sum_{j=o}^{n} \frac{Y_j - X_j}{(1+i)^{j+1}}$$

Equation (2) can be reformulated to bring out explicitly the relation between costs and returns. If investment were known to occur in Y during each of the first m periods and if X does not require any, the cost of choosing Y rather than X in each of these periods is simply the difference between net earnings in X and Y. The total investment costs would be the present value of these differences and could be written as

$$(3) \qquad C = \sum_{j=o}^{m-1} \frac{X_j - Y_j}{(1+i)^{j}}$$

The total return would be the present value of the differences between net earnings in later periods and could be written as

$$(4) \qquad R = \sum_{j=m}^{n} \frac{Y_j - X_j}{(1+i)^j}$$

The gain from choosing Y would be given by

$$(5) \qquad d = \sum_{j=m}^{n} \frac{Y_j - X_j}{(1+i)^j} - \sum_{j=o}^{m-1} \frac{X_j - Y_j}{(1+i)^j}$$

The relation between costs and returns can be derived, for our purposes in this study, by defining the internal rate of return to schooling, which is simply a rate of discount equating the present value of returns to the present value of costs. In other words, the internal rate, r, is defined implicity by the equation

$$(6) \qquad \sum_{o}^{m-1} \frac{X_j - Y_j}{(1+r)^j} = \sum_{m}^{n} \frac{Y_j - X_j}{(1+r)^j}$$

which clearly implies

$$(7) \qquad \sum_{j=o}^{n} \frac{Y_j}{(1+r)^{j+1}} - \sum_{j=o}^{n} \frac{X_j}{(1+r)^{j+1}} = d = 0$$

So the internal rate, r, is the discount rate that equates to zero the total present value of the differences between net earnings in Y and X.

The above discussion is from the viewpoint of the individual. The internal rate, which relates the earnings and costs with respect to investment of the individual in formal schooling, is defined as the private rate of return to schooling. However,

the analysis can be applied to the relation between earnings, costs, and rates of return with respect to investment of society in formal schooling. This requires a revision of the definitions of variables in the model. The net earnings streams in Y and X should respectively include all social returns, in the form of external effects on productivity and growth, personal income taxes, etc. It should incorporate all social costs of education. Thus, the internal rate derived accordingly would be defined as social rate of return to schooling.

Before we can proceed to link this theory with empirical investigation, a few remarks are in order. First, in equation (3), the total investment costs in Y has incorporated the direct and indirect costs of schooling. In each of the first m periods, the net earnings in Y is defined net of direct costs of schooling, and the net earnings in X is an indirect cost of Y for it is the earnings foregone by choosing Y rather than X. Thus the difference between net earnings in X and Y in each of these periods is the sum of direct and indirect costs of the schooling activity Y and is defined as the total costs of schooling. Secondly, direct costs of schooling which are incurred by a typical student is defined as direct private costs which include tuition, fees, outlays on books and supplies, and any living expenses beyond what would be incurred when not in school. Direct costs of schooling incurred by society is defined as direct social costs which are the sum of educational expenditures by schools and the

social cost of books and additional living expenses. Indirect social costs of schooling would be given by the output of students foregone by society.

CHAPTER III

EMPIRICAL ESTIMATION OF RATES OF RETURN

This chapter presents an attempt to estimate empirically the expected earnings and actual costs for several 1976 educational cohorts. These estimates are then used to derive private and social rates of return on schooling.

The study is restricted to a cross-section analysis for the year 1976. Although this may seem to render to the study a "static" nature, it seems that cross-section earnings data can provide a more thorough knowledge and understanding of the structure and the determinants of earnings at a point of time. They are free from the influence of the trade cycle and impicitly provide estimates in money of constant purchasing power. They serve as an indispensable pre-requisite for predictions, comparison with future data, or any "dynamic" analysis.

The basic data used for this study are records of personal characteristics from a 10% random sample[1] of the 1976 By-Census in Hong Kong, which was taken on a 10% stratified random sample of the entire land-based population on 2nd August, 1976 in Hong Kong.[2] In other words, this study is based on a 1% sample of the 1976 Hong Kong land-based population.

The following variables in the sample were utilized for estimating the gross earnings: the dependent earnings variable, the age and schooling variables, and other variables which include the sex and activity status. Appendix A gives a description of the definitions of variables.

Before we can proceed to the discussion of selecting individuals

from the sample, it is necessary at this stage to understand the educational structure of Hong Kong and to generalize the schooling age.[3] In the Hong Kong school system, a typical person attends primary education (Primary I-VI) for 6 years, junior secondary education (Middle I-III in Chinese schools or Forms I-III in Anglo-Chinese schools) for 3 years, and senior secondary education (Middle IV-V or Forms IV-V) for 2 years. Subsequently he may either enter a 1-year matriculation course (Middle VI) and a 4-year university course provided by the Chinese University of Hong Kong or enter a 2-year matriculation course (Forms VI-VII) and a 3-year university course provided by the Universityof Hong Kong. In both cases, a total of 5 years is required to complete both matriculation and university education. For uniformity and simplicity, let us assume that the average years of matriculation education would be $1\frac{1}{2}$ years and the average years of university education would be $3\frac{1}{2}$ years. We can therefore generalize that the typical person attends primary education from the age of 7 to 12, junior secondary education from the age of 13 to 15, senior secondary education from the age of 16 to 17, matriculation education from the age of 18 to $19\frac{1}{2}$, and university education from the age of $19\frac{1}{2}$ to 22.

We now proceed to the estimation of the gross earnings of individuals by age and schooling. For this purpose, the sample was splitted into 3 cohorts: A, B, and C. Cohort A is the group of the economically active males who had completed university, cohort B matriculation and senior secondary education, and cohort C junior secondary education. Their number were respectively 495, 2630, and 2033. The reason why the economically active males who had respectively completed matriculation

and senior secondary education were grouped as cohort B are that their number were respectively 252 and 2378, the former being too small for any reliable analysis, and that the earnings of the individuals of the former can be assumed to be the same as those of the latter. Therefore we can assume that throughout this study cohort B represents the economically active males who had completed senior secondary education by incorporating those who had completed matricualtion education in it. Moreover, females are excluded from this study because the analysis would be complicated by the fact that their productivity may not all have observable market values.

Table 1, 2, and 3 give estimates of the gross earnings of cohorts A, B and C respectively. Columns (2) of Tables 1, 2 and 3 give the raw mean gross earnings per month from main employment by age of the three different cohorts. Since these raw mean earnings data include both employed and unemployed persons, the probability of unemployment has also been taken into account. 1976 was a normal year with an unemployment rate of 5 percent.[4]

In order to smooth out the observed fluctuations in the raw mean earnings by age, 3-year moving averages were calculated and shown in Columns (3) of Tables 1, 2 and 3.

The average earnings of a cohort at any age is an average of the earnings of survivors and non-survivors. Obviously the latter earn nothing after they die, so the average can be computed simply by multiplying the earnings of survivors by the fraction surviving. Accordingly, Columns (3) of Tables 1, 2 and 3 were multiplied by life table survivorship rates of men in 1976 given in Columns (4)[5] to yield Columns (5). In other words, Columns (5) of Tables 1, 2 and 3 show the mean gross earnings per month by age of the three different educational cohorts in 1976 after adjusting

TABLE 1

MEAN GROSS EARNINGS OF THE 1976 COHORT OF ECONOMICALLY ACTIVE MALES WHO HAD COMPLETED UNIVERSITY EDUCATION
(in dollars)

Age	(1) Number of Cases	(2) Raw Mean Gross Earnings per Month	(3) 3-Year Moving Averages	(4) Life Table Survivorship Rate of Males	(5) Adjusted Mean Gross Earnings: Monthly	(6) Annual
22	1	700				
23	9	4954	2267	0.970	2200	26402
24	10	1148	2268	0.969	2198	29381
25	14	1902	1553	0.967	1503	18043
26	23	1609	2216	0.966	2142	25712
27	20	3137	2435	0.965	2351	28219
28	19	2561	3011	0.964	2904	34848
29	15	3335	3173	0.963	3056	36679
30	20	3624	3603	0.961	3464	41579
31	14	3850	4185	0.959	4018	48217
32	23	5082	4117	0.958	3945	47342
33	13	3419	3854	0.956	3686	44233
34	12	3060	3735	0.954	3565	42788
35	14	4726	4607	0.952	4389	52677
36	25	6036	4642	0.950	4413	52963
37	18	3163	4507	0.948	4276	51321
38	22	4322	3232	0.946	3060	36722
39	18	2210	3220	0.944	3041	36498
40	21	3127	2418	0.941	2277	27333
41	14	1916	3837	0.938	3603	43240
42	8	6468	3464	0.933	3234	38810
43	13	2006	4039	0.932	3764	45173
44	13	3641	3054	0.928	2834	34019
45	11	3515	3635	0.923	3358	40304
46	10	3749	3711	0.919	3412	40948
47	4	3870	4553	0.914	4164	49968
48	9	6040	5457	0.909	4962	59551
49	4	6462	5375	0.903	4857	58285
50	16	3623	4046	0.897	3631	43572
51	8	2053	3737	0.890	3327	39935
52	10	5535	5256	0.882	4641	55699
53	13	8182	5500	0.874	4811	57736
54	6	2783	5068	0.865	4389	52670
55	5	4240	3966	0.856	3397	40765
56	4	4875	3788	0.846	3206	38476
57	6	2250	3140	0.835	2623	31486
58	3	2296	2473	0.823	2037	24450
59	2	2875	2763	0.810	2239	26877
60	7	3118	2097	0.796	1669	20039
61	2	300				

TABLE 2

MEAN GROSS EARNINGS OF THE 1976 COHORT OF ECONOMICALLY ACTIVE MALES WHO HAD COMPLETED SENIOR SECONDARY EDUCATION
(in dollars)

Age	(1) Number of Cases	(2) Raw Mean Gross Earnings per Month	(3) 3-Year Moving Averages	(4) Life Table Survivorship Rate of Males	(5) Adjusted Mean Gross Earnings: Monthly	(6) Annual
17	11	480				
18	32	654	554	0.975	540	6487
19	67	528	604	0.974	588	7063
20	78	629	622	0.973	606	7276
21	100	710	702	0.972	683	8208
22	108	768	769	0.971	747	8967
23	104	828	814	0.970	790	9485
24	100	846	888	0.969	860	10329
25	117	989	978	0.967	946	11362
26	141	1098	1182	0.966	1143	13724
27	99	1461	1301	0.965	1256	15077
28	112	1345	1497	0.964	1443	17324
29	84	1684	1506	0.963	1451	17412
30	83	1490	1629	0.961	1566	18800
31	59	1712	1544	0.959	1482	17790
32	74	1430	1700	0.958	1629	19557
33	50	1959	1600	0.956	1530	18368
34	50	1411	1610	0.954	1537	18451
35	66	1461	1488	0.952	1417	17014
36	63	1591	1512	0.950	1438	17257
37	46	1484	1538	0.948	1459	17512
38	65	1537	1613	0.946	1527	18330
39	46	1817	1623	0.944	1533	18403
40	43	1515	1827	0.941	1721	20653
41	34	2148	1877	0.938	1762	21154
42	39	1968	2032	0.933	1898	22776
43	28	1982	1961	0.932	1828	21938
44	36	1933	2002	0.928	1858	22296
45	29	2090	1964	0.923	1815	21780
46	26	1869	1917	0.919	1762	21154
47	36	1792	1988	0.914	1819	21828
48	37	2304	1840	0.909	1673	20083
49	16	1424	1878	0.903	1697	20368
50	25	1906	1581	0.897	1419	17029
51	22	1413	1585	0.890	1411	16942
52	25	1436	1315	0.882	1161	13933
53	20	1095	1480	0.874	1295	15541
54	21	1910	1670	0.865	1446	17358
55	22	2006	2311	0.856	1980	23760

TABLE 2--Continued

Age	(1) Number of Cases	(2) Raw Mean Gross Earnings per Month	(3) 3-Year Moving Averages	(4) Life Table Survivorship Rate of Males	(5) Adjusted Mean Gross Earnings: Monthly	(6) Annual
56	24	3018	2123	0.846	1797	21569
57	17	1345	2069	0.835	1729	20748
58	16	1843	1549	0.828	1276	15315
59	7	1459	1434	0.810	1162	13949
60	28	999	1333	0.796	1061	12741
61	7	1542				

TABLE 3

MEAN GROSS EARNINGS OF THE 1976 COHORT OF ECONOMICALLY ACTIVE MALES WHO HAD COMPLETED JUNIOR SECONDARY EDUCATION
(in dollars)

Age	(1) Number of Cases	(2) Raw Mean Gross Earnings per Month	(3) 3-Year Moving Averages	(4) Life Table Survivorship Rate of Males	(5) Adjusted Mean Gross Earnings: Monthly	(6) Annual
15	21	279				
16	41	336	345	0.976	337	4053
17	60	422	408	0.975	399	4788
18	108	467	483	0.975	471	5656
19	92	560	531	0.974	517	6213
20	93	566	585	0.973	569	6835
21	106	628	617	0.972	600	7206
22	95	657	674	0.971	654	7859
23	79	736	741	0.970	719	8629
24	106	829	815	0.969	789	9479
25	88	878	853	0.967	826	9913
26	77	851	863	0.966	835	10020
27	70	860	897	0.965	866	10395
28	62	979	979	0.964	944	11338
29	62	1099	1037	0.963	999	11989
30	59	1033	1113	0.961	1071	12852
31	36	1208	1106	0.959	1061	12743
32	36	1076	1079	0.958	1034	12412
33	30	953	1061	0.956	1015	12180
34	41	1154	1034	0.954	987	11849
35	36	996	1041	0.952	992	11910

TABLE 3--Continued

Age	(1) Number of Cases	(2) Raw Mean Gross Earnings per Month	(3) 3-Year Moving Averages	(4) Life Table Survivorship Rate of Males	(5) Adjusted Mean Gross Earnings: Monthly	(6) Annual
36	31	975	973	0.950	925	11111
37	27	950	1018	0.948	966	11596
38	45	1129	1060	0.946	1003	12044
39	25	1100	1038	0.944	980	11767
40	42	884	1009	0.941	950	11409
41	27	1043	1034	0.938	971	11659
42	19	1176	1122	0.933	1048	12577
43	31	1148	1203	0.932	1121	13462
44	24	1286	1171	0.928	1087	13051
45	40	1080	1181	0.923	1091	13102
46	20	1178	1342	0.919	1234	14812
47	18	1768	1362	0.914	1245	14947
48	24	1139	1321	0.909	1201	14420
49	15	1056	1130	0.903	1021	12262
50	24	1196	1061	0.897	952	11426
51	25	930	1054	0.890	938	11267
52	16	1036	1011	0.882	893	10716
53	19	1067	1031	0.874	902	10829
54	17	990	981	0.865	849	10197
55	16	885	871	0.856	746	8961
56	18	739	812	0.846	687	8255
57	12	813	826	0.835	690	8287
58	14	927	860	0.823	708	8504
59	11	840	858	0.810	696	8353
60	15	808	785	0.796	625	7501
61	8	706				

for mortality and unemployment, and smoothing out the time series. Columns (6) of Tables 1, 2 and 3 give the corresponding annual gross earnings.

Before we can proceed to estimate the actual costs of schooling in Hong Kong, it is necessary at this stage to understand the school finance in Hong Kong. At secondary and matriculation education levels, schools are classified into two categories: government and aided schools, and private schools, the former receiving government subsidies from the Education Department and the latter receiving none. Government and aided schools are therefore able to provide fees remission to their students and private schools can hardly do so. At university education level, the two universities in Hong Kong are financed by the University and Polytechnic Grants Committee (UPGC) financially supported by the government. University students obtain financial assistance from the UPGC in the form of grants designed primarily to cover tuition fees plus certain unavoidable expenses such as stationery and books; and loans to cover living expenses.[6] The loans have to be repaid by the university student in 20 equal quarterly instalments over five years after graduation.

Private and social direct costs of schooling, as defined in chapter II, are estimated for the year 1976 and given in Table 4. Appendix B gives a detailed description of the estimation of these costs. However, it has to be noted that the direct private costs of the university education during the three and a half years, as shown in Table 4, were net of average amount of grants and loans awarded to the university student by the UPGC. Therefore, the annual repayment of loans to the UPGC by the university graduate over the five years after graduation was treated as the direct private costs of university education incurred during these periods.

TABLE 4

ESTIMATED DIRECT PRIVATE AND SOCIAL COSTS OF SCHOOLING PER STUDENT IN 1976 (in dollars)

Schooling		Duration of Schooling (in years)	Age	Direct Private Costs	Direct Social Costs
Senior Secondary Education:	Form IV or Middle IV	1	16	$700 to $850	$2,638.9 to $3,807.5
	Form V or Middle V	1	17	$700 to $850	$2,638.9 to $3,807.5
Matriculation Education :	Form VI or Middle VI	1	18	$760	$2,445.8
	Form VII	½	19	$380	$1,222.9
University Education :	First Year	½	19½	-$40.75	$11,962.8+1039$r_1$ [a]
	Second Year	1	20	-$81.5	$23,925.7+2078$r_1$
	Third Year	1	21	-$81.5	$23,925.7+2078$r_1$
	Fourth Year	1	22	-$81.5	$23,925.7+2078$r_1$
	1st year after graduation	1	23	$1,454.6	
	2nd year after graduation	1	24	$1,454.6	
	3rd year after graduation	1	25	$1,454.6	
	4th year after graduation	1	26	$1,454.6	
	5th year after graduation	1	27	$1,454.6	

[a] r_1 is the social rate of return on university education.

The gross earnings streams by schooling derived earlier in this chapter, as shown in Tables 1, 2 and 3, can now be used to derive internal rates of return to university and senior secondary education. Numerical solutions for these rates were obtained by using equation (7) in chapter II.

Private and social rates of return to senior secondary education can be derived by using net earnings streams in senior secondary and junior secondary education at the ages of 16-60, the former being the gross earnings stream of Cohort B as shown in Column (6) of Table 2 minus annual direct costs--direct private costs in the calculation of private rate and direct social costs in the calcualtion of social rate--of senior secondary education, and the latter being the same as its gross earnings stream as shown in Column (6) of Table 3.

Private and social rates of return to university education can be derived by using net earnings stream in university and senior secondary education at the ages of 18-60, the former being the gross earnings stream of Cohort A as shown in Column (6) of Table 1 minus direct costs--direct private costs in the case of calculating private rate and direct social costs in the case of calculating social rate--of university education, and the latter being the same as its gross earnings stream as shown in Column (6) of Table 2. In this study, the direct private and social costs of university education also include the direct private and social costs of matriculation education respectively because a university student, relative to a senior secondary school leaver, has to incur costs to attend matriculation education before he is admitted to university.

In the calculation of social rates mentioned above, social returns to schooling are assumed to be approximated by private returns. Also, social indirect costs of schooling are assumed to be approximated by private indirect costs.

Table 5 below summarizes the results obtained for the private and social rates of return to senior secondary and university education respectively.

Before examining the economic contents of these rates, a few technical and statiscal aspects should be considered. First, the rates as computed are extremely sensitive to the age-levels chosen for completion of school and entrance into the labor force, for these ages determine the number of years spent in school, during which students are subject to direct and indirect costs. However, we had to use rough estimates for these age-levels, which were based on indirect data (the age distribution of students)[7] and were assumed to be whole numbers.

Our second remark concerns the age at which people with different amounts of education retire. The three cohorts in this study are all assumed to retire at age 60. It is likely that people with higher amount of education such as university graduates tend to retire at a later age even after age 60. However, earnings at later ages have relatively small weights in the estimation of rates of return. An adjustment for this factor would not change the results noticeably.

Thirdly, the same male survivorship rate at each age was applied to all cohorts when earnings were adjusted for mortality in this study. Expense on health is great among university graduates.[8] Probably the survivorship rates for university graduates is greater than that for senior secondary school leavers at each age. Adjustment for the appropriate survivorshop rate would increase the estimated rates of return to university by increasing the net earnings differences between university graduates and senior secondary education at older ages. There would be a downward bias of the true rates. However, shortage of data on survivorship rates by

香港中文大學圖書館藏書

TABLE 5

ESTIMATED PRIVATE AND SOCIAL RATES OF RETURN TO SENIOR SECONDARY AND UNIVERSITY EDUCATION IN 1976

	Private Rate of Return	Social Rate of Return
Senior Secondary Education	18.39% to 18.67%[a]	14.49% to 15.75%[b]
University Education	25.19%	12.44%

[a] A figure of 18.5% is probably the best single estimate of the rate.

[b] A figure of 15.0% is probably the best single estimate of the rate.

education at each age limits the estimation of the magnitude of the biases.

As for the theoretical evaluation and the interpretation of the internal rates estimated here, we should emphasize several qualifications. These are strictly private money-rates based on a cross-section of the population. They are not adjusted for taxation, for secular growth, for improvement of quality of schooling and of productivity over time. They do not take into account differential ability between schooling levels and between ages, nor are they adjusted to take account of any form of non-pecuniary returns and of the consumption aspects of schooling. We shall examine below each of these factors for its possible biasing effect on the estimated earnings streams and internal rates. However, it seems preferable not to try to make partial adjustments of the numerical estimates to account for some of these factors because such adjustments may never

account for all the factors mentioned. Most of these adjustments would be of varying and unknown degree of reliability and would mask the results of the particular sample used here to an unknown extent so that it would be difficult to introduce changes in the estimates if new and better information become available, or if the reader's different intuitive presumption and prior ideas would lead him to give away some assumptions or methods of adjustments.[9] For all these reasons, the original rates are presented here, unadjusted for additional biases mentioned above. These rates and the gross earnings streams estimated above could then be used as a basis for additional modifications and adjustments by the interested reader.

However, the conceptual difficulties, as well as the probable directions of bias associated with each of the factors mentioned above, are examined briefly in the following paragraphs.

Income taxes should be deducted from earnings, if we assume that private gains from education are based on after-tax earnings. The progressiveness of income tax, as well as a secular rise in tax rates, tend to reduce net earnings differentials. Therefore, adjustment for taxation would reduce the estimated rates.

Secular growth in real earnings over time is not reflected in cross-sectional data in this study. Any individual currently graduating from school could reasonably assume that his future earnings would profit from the growth of the economy and from technological changes, and would therefore be higher than observed in the cross-section among older persons who had graduated earlier with equal schooling. However, the rate of growth of earnings may vary in all age and education categories, and thus income differentials between corresponding schooling levels may either increase or diminish. If, however, the rate of growth is assumed to be a constant

percentage, then absolute earnings differences increase, and an adjustment for growth would increase the estimated rates of return.[10]

Improvements in the quality of schooling and in productivity over time are also not reflected in a cross-section. Each new cohort of school leavers is better educated and more productive than the last. Estimates of lifetime earnings from current earnings would understate the expected rate of return on education.[11]

The lack of adequate information about ability is another omission in the estimated rates. Ability appears to be positively correlated within an age group, with the level of schooling achieved. Thus, the estimated differentials between schooling levels tend to over-estimate the true differentials that an individual can expect to realize. In addition, quantitative evidence derived by Becker (1975) from five independent studies of adjustments for differential ability--adjustments for rank in class, IQ, father's education and occupation, personality, ability to communicate, motivation, and family upbringing--suggests that only a small part of the apparently large return to university graduates results from differential ability, and much of the large apparent return to primary and secondary education does result from differential ability. Adjustments of rates of return for differential ability would lower the private rate of return more to secondary school than to university education.[12]

Persons with higher education generally get longer vacations, higher social status, and higher stability of earnings. Also they derive direct satisfaction from schooling and the costs of schooling are only partly an investment. To the extent that schooling is an act of consumption, the expenditures on schooling are consumption expenditures, and only part of the total costs of schooling should be deducted from earnings. Adjusting

for all these non-pecuniary factors would tend to increase the estimated rates of return from schooling.

The estimated gross earnings of different cohorts in this study were their incomes from main employment. It is likely that the fringe benefits of their main employment, ranging from pensions, life insurance, medical and housing allowances, to subsidised holidays, had not been counted in their reported earnings. Presumably, an individual with higher level of education tends to enjoy more fringe benefits associated with their jobs. This indicates that there would be a downward bias in the private rate estimates especially for university graduates.

We would not attempt to speculate about the overall effect of all these components of bias combined. Each element of bias may well vary both in magnitude and in direction between levels of schooling. We rather would interpret the estimated rates accordingly and keep the reservations in mind.

CHAPTER IV

DISCUSSION OF FINDINGS

Private and social rates of return to senior secondary education in this study are estimated to be 18.5% and 15% respectively, the former being 3.5 percentage points higher than the latter. On the other hand, private and social rates of return on university are 25.5% and 12.4% respectively, the former being 12.8 percentage points higher than the latter.

The discrepancy between estimated private and social rates of return to university education is much greater than that to senior secondary education. It shows that university education is heavily subsidized by the government as compared to senior secondary education in Hong Kong. As high government subsidies to university education reduce the private direct costs of it, university education in Hong Kong becomes an attractive investment for the individual. This explains the fact that individuals in Hong Kong have been making great efforts to enter into university.

In Table 6, the rate of return estimates of this study are compared with a study of rates of return to schooling in 32 developed and developing countries by Psacharopoulos in 1973.[13] The comparison shows that the estimated private and social rates of return to senior secondary and university education in Hong Kong are similar to those in developing countries, but higher

TABLE 6

PRIVATE AND SOCIAL RATES OF RETURN TO EDUCATION IN HONG KONG AND OTHER COUNTRIES (PER CENT)

	Educational Level					
	Secondary			Higher		
	Private	Social	Difference	Private	Social	Difference
Developed Countries	11.9	9.5	2.4	11.9	9.4	2.5
Developing Countries	18.5	15.2	3.3	22.0	12.4	9.6
All 32 Countries	16.3	13.5	2.8	17.5	11.3	6.2
Hong Kong	18.5	15.0	3.5	25.2	12.4	12.75

Source: Rows 1-3 are based on the Psacharopoulos work. Row 4 is the findings of this study, referring to senior secondary and university education respectively.

than those in developed countries. This clearly indicates the important role of investment in education in the process of economic growth and development. Also, it shows that the difference between

private and social rates of return to university education in Hong Kong is greater than that in developing countries and much greater than that in developed countries. This suggests that the incentive for an individual to invest in university education will be stronger in Hong Kong than in most developing countries, and much stronger than in developed countries. However, the divergence between the private and social rates of return to senior secondary education in Hong Kong is similar to that in developing countries.

In Table 7, the estimated rates in Hong Kong are compared with those in 8 Asian countries in the Psacharopoulos work. The comparison shows that private and social rates of return to senior secondary and university education are similar to those in Singapore and higher than those in Japan. Private rates of return to university education in Hong Kong and Singapore are both the highest among 9 Asian countries. This further supports the view that university education in Hong Kong is a profitable investment for the individual.

TABLE 7

RATES OF RETURN TO EDUCATION

IN ASIAN COUNTRIES (PER CENT)

		Educational Level			
		Secondary		Higher	
		Private	Social	Private	Social
Hong Kong	1976	18.5	15.0	25.2	12.45
India	1960	19.2	16.8	14.3	12.7
Malaysia	1967		12.3		10.7
Singapore	1966	20.0	17.6	25.4	14.6
The Philipines	1966	28.0	21.0	12.5	11.0
Japan	1961	6.0	5.0	9.0	6.0
S. Korea	1967		9.0		5.0
Thailand	1970	14.5	13.0	14.0	11.0
Taiwan	1973	12.7	12.6	15.8	17.7

Source: Row 1 is based on the findings of this study referring to senior secondary and university education respectively. Rows 2-8 are based on the Psacharopoulos work.

CHAPTER V

SUMMARY

Private rates of return to senior secondary education and university education are estimated to be 18.5% and 25.2% respectively in this study; whereas the corresponding social rates are 15% and 12.44% respectively. These estimates are unadjusted for taxation, for secular growth, for improvement of quality of schooling and of productivity over time, for differential ability, and for non-pecuniary returns and the consumption effects of schooling.

As compared with estimated rates in other countries, the estimated private and social rates of return to senior secondary and university education in this study are generally higher than those in developed countries but similar to those in developing countries. This phenomenon suggests that the role of investment in the process of economic growth and development is important as evidenced by the rapid expansion of education in Hong Kong. As compared with Asian countries, the rate of return estimates of Hong Kong are similar to those of Singapore and higher than those in Japan.

The large discrepancy between private and social rates of return to university education in Hong Kong reflects the fact that university education is heavily subsidized by the government and

has become a profitable investment for individuals in Hong Kong. Individuals may increasingly incur high costs in making great efforts to get into university.

APPENDIX A

DEFINITIONS OF VARIABLES

The definitions of terms and variables used in this study are the same as those used in the Hong Kong 1976 By-Census. The following gives a description of these definitions.

Age - The number of complete years passed since birth.

Income from main employment - For employers or the self-employed, this is the amount earned excluding expenses incurred in running the business, e.g. costs in purchasing materials and supplies, labour costs, rents and rates for buildings or machines; for employees, the amount earned including salary or wages, commissions, bonuses, overtime, tips and other cash allowances except housing allowance.

Economically active males - Males who are outworkers, self-employed, employers, employees in the Government and private sectors, on leave, waiting to start work, temporarily laid off work, and looking for full-time job.

Educational attainment - The highest level (class or year) of general education attained in junior secondary, senior secondary, or matriculation classes or at a university.

Primary - Primary I - VI in the Hong Kong school system.

Junior secondary - Middle I - III in Chinese schools or Forms I - III in English or Anglo-Chinese schools.

Senior secondary - Middle IV - V in Chinese schools or Forms IV - V in English or Anglo-Chinese schools.

Matriculation - Middle VI in Chinese schools or Forms VI - VII in English or Anglo-Chinese schools.

University - This refers to persons attending full-time courses at a university/other post-secondary institution leading to a degree or diploma, or persons taking a correspondence course leading to a degree, or persons who had undertaken full-time degree courses but failed, or persons who had obtained first or higher degrees at a university/other post-secondary institution.

(Note: For persons who were undertaking/had undertaken technical and vocational training, only their highest level of general education was recorded.)

APPENDIX B

ESTIMATES OF DIRECT COSTS OF SCHOOLING

I. Direct Private Costs

Information on enrollment, standard fees, and maximum percentage of fees remission for 1976 in government, aided, and private secondary schools at senior secondary and matriculation education levels were shown in Table A-I. The average fees in senior secondary education per annum, Y_1, could be estimated from the formula

$$Y_1 = \frac{W_1 \times S_1 + W_2 \times S_2}{S_1 + S_2}$$

where W_1 and W_2 are respectively the average fees per senior secondary student in government and aided, and private secondary schools. S_1 and S_2 are the corresponding student enrollment. W_1 would be \$220 in 1976 if the maximum percentage of fees remission was practised in all government and aided secondary schools and \$400 if fees remission was not practised at all.[14] Based on this assumption, Y_1 thus calculated were respectively \$757.3 and \$813.3. For simplicity, the annual private direct costs per senior secondary student were \$700 as the lower limit and \$850 as the upper limit.

Also, the average fees in matriculation education per annum, Y_2, could be estimated from the formula

$$Y_2 = \frac{W_3 \times S_3 + W_4 \times S_4}{S_3 + S_4}$$

TABLE A-I

ENROLLMENT AND FEES IN SENIOR SECONDARY

AND MATRICULATION EDUCATION, 1976

	Government	Aided Schools	Private Schools
Senior Secondary Education			
Enrollment (Percentage of Total)	6416 (6.45%)	24522 (24.67%)	68466 (68.88%)
Standard Fees Per Annum	$400	$400	$1,000
Maximum Percentage of Fees Remission	45%	45%	0%
Matriculation Education			
Enrollment (Percentage of Total)	1028 (12.5%)	7201 (37.5%)	7728 (50%)
Standard Fees Per Annum	$450	$450	$1,400
Maximum Percentage of Fees Remission	50%	50%	0%

Source: Enrollment figures were obtained from Education Department, Annual Summary: 1975 - 76 (Hong Kong: Hong Kong Government, 1976), pp. 39-43. Standard fees per annum and maximum percentage of fees remission were based on Report of the Board of Education on the Proposed Expansion of Secondary School Education in Hong Kong over the Next Decade, (Hong Kong: Hong Kong Government, 1973), pp. 47-48.

where W_3 and W_4 are respectively the average fees per matriculation student in government and aided, and private schools. S_3 and S_4 are the corresponding student enrollment. Maximum fees remission was assumed to be practised in all government and aided schools and W_3 therefore \$225. Y_2 was found to be \$794 in 1976.[15] However, a matriculation student received an average amount of grants of \$34 per annum. Therefore, the annual direct private costs per matriculation student net of grants was approximately \$760 in 1976.[16]

The University and Polytechnic Grants Committee of Hong Kong (UPGC) estimated that a typical university student had to spend \$2,620 in 1976 on tuition, fees, and expenses on books and supplies. However, he received an average amount of grants of \$623.4 and an average amount of loans of \$2,078 during each year of his university education. Therefore, the annual direct private costs per university student net of these grants and loans would be -\$81.5.[17] It has to be noted that the total amount of loans a typical university student received during his $3\frac{1}{2}$ years of schooling, \$7,273, had to be repaid in 20 equal quarterly instalments over five years after graduation. Therefore a university graduate had to repay \$1,454.6 per annum over five years after graduation.[18] This amount of annual loans repayment should also be counted as direct private costs of university education incurred in each of these five years.

II. Direct Social Costs

Information on educational expenditures on senior secondary

and matriculation education in 1976 can be estimated from the annual summary of the Education Department for the year 1975-1976. We assume that the government subsidizes 100% of the educational expenditures on senior secondary and matriculation places in government schools, 80% in aided schools, and 0% in private schools. Based on Table A-I and the assumption above, we derived that 26.2% of educational expenditures on each senior secondary school place was paid by government subsidies and 73.8% at the private and aided schools' own expenses.[19] In 1976, the government expenditures on each secondary or matriculation place was estimated to be $774.5, while the corresponding aided and private schools' own expenses would be $2,182.9 if educational expenditures were the same among all categories of senior secondary schools, or $1,164.3 if educational expenditures of private schools were only one half of those of government and aided schools. Therefore, the sum of educational expenditures by both the government and the private sector on each senior secondary place ranged from $1,938.9 to $2,957.5.[20]

By the same method of estimation, we derived that 42.5% of educational expenditure on each matriculation place was paid by government subsidies, and 57.5% at the private and aided schools' own expenses.[21] The sum of educational expenditures by both the government and the private sector on each matriculation place was estimated to be $1,685.7 in 1976 if educational expenditures were the same among all categories of matriculation schools.[22]

Direct social costs would be the sum of educational expenditures by the society and the social cost of books and additional living expenses. While the former for senior secondary and matriculation was obtained above, the latter was approximated by their private costs. Therefore direct social costs of each senior secondary and matriculation school place were respectively in the range of $2,638.9 to $3,807.5 and $2,445.8.[23]

Direct social costs on university education would be the sum of educational expenditures by universities, including capital and current costs, and the social cost of books and additional living expenses. While the latter can be approximated by their private cost, the former would be the sum of educational expenditures on university education, grants awarded to university students, and the interest costs of loans to university students by the UPGC. Average educational expenditures on each university place was estimated to be $20,682.4 in 1976.[24] It has to be noted that expenditures on non-educational activities in university education were eliminated from the total. Average amount of grants to each university place was $623.4. Since an average amount of loans of $2,078 was awarded to each university place by the UPGC in 1976, the interest costs of this loan could be estimated by $2078r_1$, where r_1 is the social rate or return on university education, providing the loans fund of the UPGC is a revolving fund and loans are repaid in full by university graduates. The estimated direct social costs of each university place was therefore $\$23,925.7 + \$2078r_1$ in 1976.[25]

FOOTNOTES

[1] The 10% sample of the 1976 By-Census in Hong Kong was taken by random sampling.

[2] For the Land By-Census, a one-stage stratified paired-selcetion sampling method was adopted. For the By-Census a 10% sample was adopted because it was established that a 10% sample gave a maximum relative error (at a 95% level of confidence) of not greater than $\pm$ 10% for the major characteristics of the population, and this degree of precision was considered acceptable. For further information, see Census and Statistics Department, Hong Kong By-Census 1976: Main Report (Hong Kong: Hong Kong Government, 1978), I, 161.

[3] Education Department, Annual Summary: 1975-76 (Hong Kong: Hong Kong Government, 1976).

[4] Census and Statistics Department, Hong Kong Annual Digest of Statistics (Hong Kong: Hong Kong Government, 1981), p. 38.

[5] Census and Statistics Department, Hong Kong Life Tables (Hong Kong: Hong Kong Government, 1978), p. 12.

[6] University and Polytechnic Grants Committee of Hong Kong, Report: July 1976 to June 1978 (Hong Kong: Hong Kong Government, 1978), p. 26.

[7] Education Department, pp. 21-22.

[8] Gary S. Becker, Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education, 2nd ed. (Chicago: University of Chicago Press, 1975) p. 167.

[9] Giora Hanoch, "Personal Earnings and Investment in Schooling," Diss. University of Chicago 1965, p.76.

[10] Becker, pp. 154-155.

[11] Ibid., pp. 216-221.

[12] Ibid., pp. 157-166.

[13] George Psacharopoulos, Returns to Education: An International Comparison (San Francisco: Jossey-Bass, 1973).

[14] If the maximum percentage of fees remission was practised in all government and aided schools, W_1 would be \$400 x (1 - 45%) or \$220.

[15] If the maximum percentage of fees remission was practised in all government and aided schools, W_3 would be \$450 x (1 - 50%) or \$225.

[16] The annual direct private costs per matriculation student net of grants in 1976 was given by (\$794 - \$34) or \$760.

[17] The annual direct private costs per university student net of grants and loans was given by (\$2,620 - \$623.4 - \$ 2,078) or -\$81.5.

In the academic year 1975-76, the total number of university students was 8073 and the total amount of grants and

loans were respectively $5,033,000 and $16,776,000. See University and Polytechnic Grants Committee of Hong Kong, pp. 29-30. The average amounts of grants and loans were respectively $623.4 and $2078.

[18] The total amount of loans a typical university student received during his $3\frac{1}{2}$ years of schooling = $2078 x 3 = $7,273.

The amount of annual loans repayment by a university graduate per annum over 5 years after graduation = $7,273 ÷ 5 = $1,454.6.

[19] For educational expenditures on each senior secondary school place, (100% x 6.45% + 24.67 x 80%) or 26.19% would be paid by government subsidies, and (1 - 26.19%) or 73.81% would be aided and private schools' own expenses.

[20] Government expenditures and enrollment on all secondary and matriculation education were obtained from Education Department, Annual Summary: 1975-1976.

If the government spent $774.5 on each senior secondary school place, the aided and private schools would incur ($774.5 x 73.81) ÷ 26.19 = $2,182.9. If the private secondary schools' expenditures were only one half of those in government and aided schools, the private schools would only spend $774.5 x (4.93% + 68.88% x $\frac{1}{2}$) ÷ 26.19 = $1,164.3 on each secondary school place. Hence average social costs on each secondary school

place per annum in 1976 ranged from ($2,182.9 + $774.5) or $2,957.5 to ($1,164.3 + $774.5) or $1,938.9.

[21] For educational expenditures on each matriculation place, (100% x 12.5% + 80% x 37.5%) or 42.5% would be paid by government subsidies and (1 - 42.5%) or 57.5% would be paid by private schools.

[22] Average social costs on each matriculation place per annum was given by ($774.5 + $774.5 x 50%÷42.5%) or $1,685.7.

[23] Direct social costs of each senior secondary and matriculation school place ranged from ($1,938.9 + $700) to ($2,957.5 + $850), or $2,638.9 to $3,807.5 in 1976.

Direct social costs of each matriculation place was given by ($1,685.8 + $760) or $2,445.8.

[24] University and Polytechnic Grants Committee of Hong Kong, pp. 55-61.

[25] The direct social costs per each university place

$= \$20,682.4 + \$623.4 + \$2,620 + \$2,078r_1$

$= \$23,925.7 + \$2,078r_1$

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CURRICULUM VITAE

Fan-sing Hung was born on December 3, 1952 in Hong Kong. He graduated from The Chinese University of Hong Kong in 1974 with a Bechelor of Social Science degree in Economics. He obtained a Diploma of Education from the School of Education at The Chinese University of Hong Kong in 1977. He was admitted to the Master of Arts Programme in the School of Education at The Chinese University of Hong Kong in 1979.


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